

What is claimed is:

1. A method for forming a photoresist relief image on a substrate comprising:
  - (a) applying a coating layer of a chemically-amplified positive photoresist composition on a substrate, the photoresist composition comprising a resin and a photacid generator compound and a sensitizer compound; and
  - (b) exposing the photoresist coating layer to patterned activating radiation having a wavelength of less than about 200 nm and developing the exposed photoresist layer to provide a relief image.
2. The method of claim 1 wherein the sensitizer is a separate component of the photoresist composition.
3. The method of claim 1 or 2 wherein the sensitizer is an aromatic compound.
4. The method of any one of claims 1 through 3 wherein the sensitizer is a carbocyclic aryl compound.
5. The method of any one of claims 1 through 4 wherein the sensitizer is a heteroaromatic compound.
6. The method of any one of claims 1 through 5 wherein the sensitizer has from 1 to 3 separate or fused rings.
7. The method of any one of claims 1 through 6 wherein the photoacid generator compound is an onium compound or a non-ionic compound.
8. The method of any one of claims 1 through 7 wherein the photoacid generator compound is an iodonium or sulfonium photoacid generator compound

which has one or more cation substituents selected from the group consisting of optionally substituted naphthyl, optionally substituted thienyl and pentafluorophenyl.

9. The method of claim 1 wherein the photoacid generator comprises a sulfonium compound with the sulfur cation being a ring member.

10. The method of any one of claims 1 through 9 wherein the photoacid generator compound is a non-ionic oxime sulfonate compound or a non-ionic N-oxyimidosulfonate compound.

11. The method of any one of claims 1 through 10 wherein the photoacid generator is a compound of any one of Formula I through XIV, XIVA, XV, XVI, XVII, XVII', XVIII, XVIII', XIXa, XVIIIb, and XVIIIc.

12. The method of any one of claims 1 through 11 wherein the photoresist coating layer is exposed to radiation having a wavelength of about 193 nm.

13. A photoresist composition comprising a resin and a photoacid generator system,

the system comprising a sensitizer compound and a photoacid generator compound that is 1) an iodonium or sulfonium photoacid generator compound which has one or more cation substituents selected from the group consisting of optionally substituted naphthyl, optionally substituted thienyl and pentafluorophenyl, or 2) a non-ionic oxime sulfonate compound or a non-ionic N-oxyimidosulfonate compound.

14. The photoresist of claims 13 wherein the sensitizer is a separate component of the photoresist composition.

15. The photoresist of claims 13 or 14 wherein the sensitizer is an aromatic compound.

16. The photoresist of any one of claims 13 through 15 wherein the sensitizer is a carbocyclic aryl compound.

17. The photoresist of any one of claims 13 through 16 wherein the sensitizer is a heteroaromatic compound.

18. The photoresist of any one of claims 13 through 17 wherein the sensitizer has from 1 to 3 separate or fused rings.

19. The photoresist of any one of claims 13 through 18 wherein the photoacid generator comprises a sulfonium compound with the sulfur cation being a ring member.

20. The photoresist of any one of claims 13 through 18 wherein the photoacid generator is a compound of any one of Formulae I through XIV, XIVA, XV, XVIA, XVIB, XVIB', XVIC, XVIC', XVICa, XVICb, and XVICc, as those formulae are defined above.

21. The photoresist of any one of claims 13 through 20 wherein the composition is a chemically amplified positive-acting photoresist.

22. The photoresist of claim 21 wherein the resin comprises a polymer that contains phenolic and photoacid-labile alkyl acrylate units.

23. The photoresist of claim 21 wherein the resin comprises a polymer that contains 1) phenolic units, 2) phenyl units that do not have hydroxy or carboxy ring substituents, and 3) photoacid-labile alkyl acrylate units.

24. The photoresist of claim 21 wherein the resin comprises acetal or ketal groups.

25. The photoresist of claim 21 wherein the photoresist is essentially free of polymers containing aromatic units.

26. The photoresist composition of any one of claims 13 through 20 wherein the composition is a negative-acting photoresist.

27. A method for forming a photoresist relief image on a substrate comprising:

- (a) applying a coating layer of a photoresist composition of any one of claims 13 through 26 on a substrate; and
- (b) exposing the photoresist coating layer to patterned activating radiation and developing the exposed photoresist layer to provide a relief image.

28. The method of claim 27 wherein the photoresist coating layer is exposed to radiation having a wavelength of less than about 300 nm.

29. The method of claim 27 wherein the photoresist coating layer is exposed to radiation having a wavelength of less than about 200 nm.

30. The method of claim 27 wherein the photoresist coating layer is exposed to radiation having a wavelength of about 248 nm, 193 nm or 157 nm.

31. An article of manufacture having on at least one surface a coating layer of the photoresist composition of any one of claims 13 through 26.

32. An article of manufacture comprising a microelectronic wafer or flat panel display substrate that has on at least one surface a coating layer of a photoresist of any one of claims 13 through 26.

33. A photoacid generator system comprising a sensitizer compound and a photacid generator, the photoacid generator having a substituent selected from the group consisting of optionally substituted naphthyl, optionally substituted thienyl and

pentafluorophenyl, or the photoacid generator is a sulfonium compound with the sulfonium atom being a member of an optionally substituted thienyl group.

34. The photoacid generator sensitizer of claim 33 wherein the photoacid generator is of the Formulae I through XIV, XIVA, XV, XVIA, XVIB, XVIB', XVIC, XVIC', XVICa, XVICb, and XVICc.